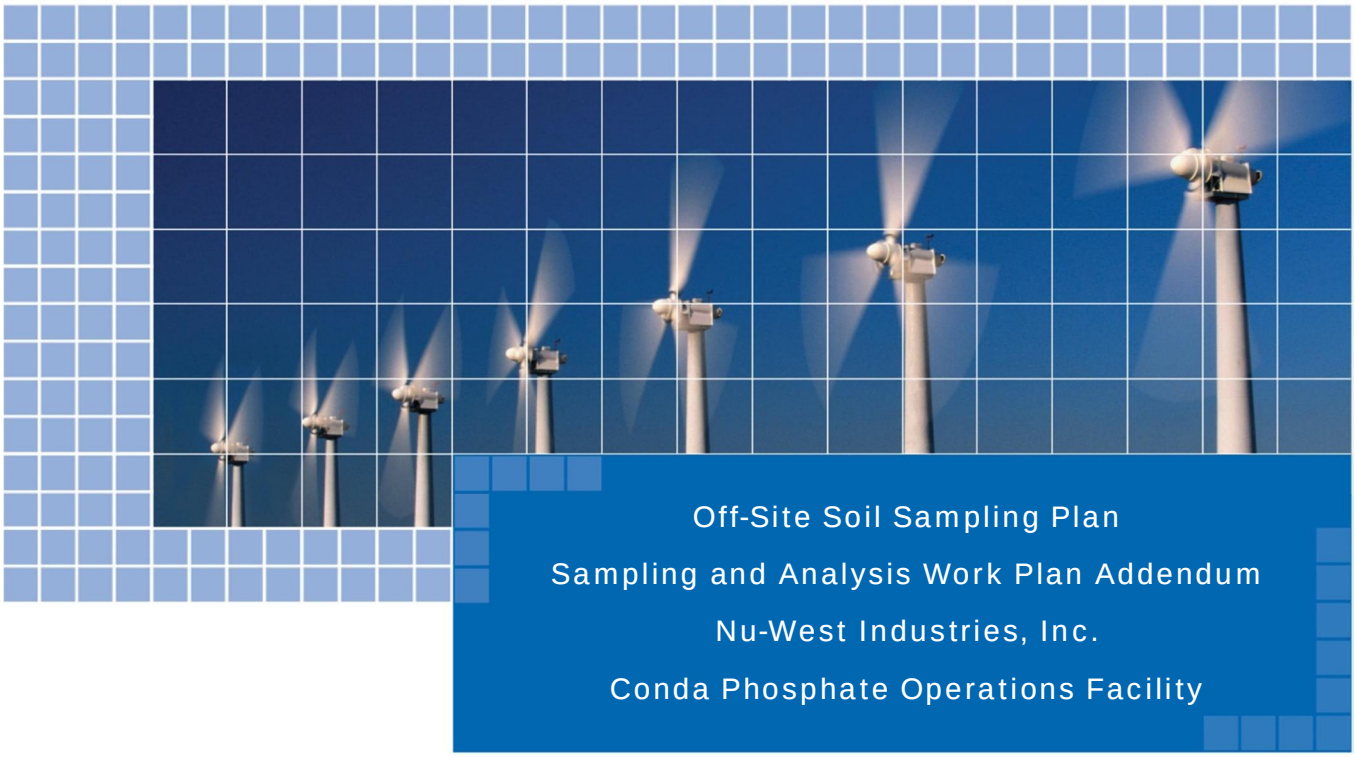

Off-Site Soil Sampling Plan

Sampling and Analysis Work Plan Addendum

Nu-West Industries, Inc.

Conda Phosphate Operations Facility

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1 Introduction

On behalf of Nu-West Industries (Nu-West), WSP Environment & Energy (WSP) has prepared this revised Off-Site Soil Sampling Plan Addendum (Sampling Plan) for the Conda Phosphate Operations (CPO) facility in Soda Springs, Idaho (Figure 1). The revised Sampling Plan addresses comments on the initial plans (WSP 2010 and 2011) received from the U.S. Environmental Protection Agency (EPA; 2011a and 2011b) and is submitted pursuant to the June 2009 Administrative Order on Consent between Nu-West and the EPA (EPA 2009).

This Sampling Plan describes the methodology to characterize impacts to off-site soil potentially affected by the 2003, 2006, and 2009 releases of process water from the decant ditch system to the property west of the CPO facility (Figure 2).[1] The off-site properties potentially impacted by the releases are jointly referred to as the "Torgesen Ranch" (Subject Property). To facilitate the understanding of anthropogenic background conditions, soil samples will also be collected from three privately-owned properties with similar histories to the Subject Property (Figure 3).

Background and off-site soil sampling will be conducted using multi-incremental sampling (MIS) methods. Both sets of soil data will be used to develop representative, defensible concentrations that will be used to evaluate potential relative impacts to the Subject Property. The off-site data will be compared to available human health and ecological screening values to determine if any additional action is necessary. In instances where the background concentrations exceed the regulatory screening levels or there are no screening levels, the background data will be used for comparison with the off-site sample results.

Except as otherwise noted, all work will be performed in accordance with the Quality Assurance Project Plan (QAPP) and Health and Safety Plan, which are part of the Work Plan.

1.1 PROPERTY DESCRIPTIONS

The CPO facility is along the eastern limit of a broad, north-south trending valley. The Southern and Northern properties identified for background sampling are situated along the eastern and western limits of the valley, respectively. The Central property identified for background sampling and the adjacent Subject property are within the middle of the valley. The regional topography slopes gradually to the south. The local geologic stratigraphy consists of a thin veneer of unconsolidated alluvial material consisting predominately of silt and silty clay underlain by basalt and sandstone bedrock.

1.1.1 Subject Property

The Subject Property is directly west of the CPO facility; it is comprised of approximately 450 acres (Figure 1). The topography across the Subject Property ranges from approximately 6,165 to less than 6,140 feet mean sea level (ft-msl). A large fault line, which displays a vertical displacement of about 15 feet, is present at the Subject Property. Radiating from this escarpment are surficial lows where surface water accumulates seasonally and subsequently infiltrates into the subsurface, evaporates, or is used. A low-lying area extends from the northeast portion of the property (near the southwest limit of Tailings Pond 2 at the CPO facility), to the southwest. Surface water that originates at Woodall Spring approximately 1 mile

[1] The term "off site" is used for simplicity; the 2003 release is not believed to have migrated off site; the sampling program is designed to evaluate this premise.

northeast of the CPO facility flows south onto the facility via two ditches then flows within this low-lying area on the Subject Property. The Subject Property is currently and has historically been used for barley and hay production and cattle grazing. Although the area between the 2006 release areas has not been recently cultivated, it does receive runoff from the adjacent cultivated areas. Several storage buildings are present in the western portion of the Subject Property.

1.1.2 Background Properties

The three properties identified for background sampling ("background properties") are surrounded by land primarily used for barley production and grazing (much of the property surrounding the northern property is owned by the Idaho Citizens Grazing Association).

The northern property (North Property) is approximately 9 miles northwest of the CPO facility and approximately 1 mile west of the Blackfoot Reservoir. Government Dam Road forms the eastern limit of the property. The property is approximately 158 acres. The topography slopes to the southeast from approximately 6,440 to 6,240 ft-msl. An ephemeral stream crosses the property draining to the south-southeast. The property is used to grow barley; according to the property owner it has been similarly used historically (e.g., grain production). There are no buildings on the property.

The central background property (Central Property) is approximately 4 miles northwest of the CPO facility. Government Dam Road crosses the western-most portion of the property; China Cap Road forms the northern limit of the property. The property is approximately 320 acres. The elevations range from approximately 6,240 to 6,180 ft-msl; the topography undulates with several north-south running depressions in the eastern portion. Use of the eastern area is limited by these depressions: crops are in the flatter abutting areas. There is generally less relief in the western portion of the property which is more intensely cultivated, except in the western-most area where there is more significant relief. The property is used to grow barley; according to the property owner it has been similarly used historically (e.g., grain production). There are no buildings on the property.

The southern background property (South Property) is bordered to the north, south, and west by agricultural property; it is bordered to the east by State Route 34. The property is approximately 240 acres. The topography slopes to the east-southeast from approximately 6,240 to 6,160 ft-msl. Along the western portion of the property is an escarpment reflecting another fault line in the area. The property is used for barley production; a storage building and ancillary ranch buildings are present in the northeast corner. The property is largely cultivated, although the western portion is dotted with uncultivated areas. According to the property owner it has been similarly used historically (e.g., grain production).

1.2 RELEASE HISTORY

Fertilizers are produced at the CPO facility; the processing byproduct is a slurry containing low pH process water and phosphogypsum solids. This material is placed in a series of gypsum (gyp) stacks. One of the gyp stacks is identified as the Old Gyp Stack: water drains via a decant ditch west of the Old Gyp Stack in the southerly direction to the Cooling Ponds. In 2003, 2006, and 2009, water from the decant ditch system was released, as shown on Figure 1. These three releases are described in greater detail in this section.

1.2.1 2003 Release Background

In November 2003, approximately 4,400 gallons of low pH process water from the Old Gyp Stack (F-GYP-0) was released from the adjacent decant ditch. The release occurred after a portion of the bank associated with the gyp stack sloughed into the decant ditch and dammed the ditch. Water in the ditch then overflowed across the adjacent roadway, presumably entering the low-lying area west of the roadway and north of the West Cooling Pond (Figure 4). Reportedly, the release did not migrate beyond the CPO property boundaries and no characterization of soil conditions was performed.

To assess potential impacts from the 2003 release, sampling and analysis of the on-site spill and nearby off-site areas will be performed.

1.2.2 2006 Release Background

On December 27, 2006, process water was released from the Phase I Gyp Stack (F-GYP-1) into the adjacent decant ditch and overflowed onto the neighboring Subject Property in Area A (approximately 10 acres) and Area B (approximately 2 acres), where topographical depressions confined the flow (Figure 5). The footprints shown in the figure are based on a survey conducted at the time of the release; the limits of the release were readily discernable based on snow melt and the fact that the material froze in place. By December 30, 2006, approximately 1.76 million gallons of water/ice were recovered and removed. Crushed limestone was placed in the footprint of the release in both areas to neutralize residual acidity.

In 2007 and 2008, soil samples were obtained from locations in Area A where water had accumulated and frozen. Several constituents were reported at concentrations above the Idaho Department of Environmental Quality (IDEQ) Target Remediation Goals (TRG). Based upon these results Nu-West prepared an ecological risk assessment and an excavation plan. The excavation plan included the removal of soil from areas surrounding the five sample locations with elevated results and the collection of post-excavation verification samples. Several phases of excavation and verification sampling were completed. The excavation phases removed up to 2 feet of soil from the surface of the impacted areas (Figure 5). Once the excavation was complete, the excavated areas were backfilled with clean topsoil.

Analytical results for five post-excavation samples were collected on behalf of Torgesen Ranch. The analytical results indicated that in three of the five post-excavation samples concentrations of chromium, cadmium, selenium, and vanadium exceeded the TRGs, and suggested the response action may have been incomplete.

Based on these data, and in accordance with the data quality assurance and data quality objectives established in the Work Plan, additional sampling will be performed to further evaluate soil quality in the areas on the Subject Property potentially impacted by the 2006 release.

1.2.3 2009 Release Background

In April 2009, process water was released from the decant ditch and overflowed onto the southeastern corner of the Subject Property (Figure 6). The area potentially affected by this release is approximately 120 feet by 120 feet (0.31 acres) with the majority of the water contained to an area measuring approximately 60 feet by 60 feet.

To assess potential impacts from the release, surficial soil samples (2 to 4 inches below ground surface [in-bgs]) were collected in the release area and one sample was collected outside the release area. A sample of gypsum material that flowed into the area was also collected for

analysis. The samples were analyzed for phosphorus, pH, and metals. The analytical results indicated that chromium, cadmium, selenium, and vanadium concentrations were below the TRGs.

Because concentrations of these metals and other constituents of potential interest were above the screening criteria subsequently established in the Work Plan, additional sampling and analysis will be performed to further evaluate soil quality as potentially impacted by the 2009 release.

1.3 DATA QUALITY OBJECTIVES

The EPA's DQO process was developed to ensure that data collection is designed in a manner appropriate to support the projects decision making process (EPA 2006a).

1.3.1 State the Problem

Releases of low pH process water occurred at the CPO facility, which produces granular monoammonium phosphate and liquid phosphate fertilizer products, in 2006, 2009, and 2003. The 2006 and 2009 releases migrated onto the Subject Property; the 2003 release was confined to CPO property.

The Subject Property may be affected by application of pesticides, herbicides, and fertilizer associated with agricultural use, including barley production and cattle grazing. To account for such impacts anthropogenic background conditions need to be ascertained.

1.3.2 Identify the Decision

The primary decisions to be made based are: (1) if constituents of potential interest are present at concentrations in one or more of the exposure units associated with the releases that pose a potentially unacceptable risk to human health or the environment; and (2) do conditions warrant further evaluation. Sections 2, 3, and 5 address the constituents of potential interest, exposure units related to the release areas, and screening levels.

1.3.3 Identify Inputs to the Decision

The primary inputs are:

- a sampling plan that obtains data representative of anthropogenic background conditions
- a sampling plan that obtains data representative of conditions in each of the areas of interest
- an analytical program with methods and reporting limits (RLs) and method detection limits (MDLs) such that constituents of potential interest are quantified at levels below the corresponding screening levels

Sections 2 through 4 address the development of the sampling and analytical program consistent with these inputs.

1.3.4 Define the Study Boundaries

The boundaries of the release areas and anthropogenic background areas addressed in this Sampling Plan are defined in Section 3. The release area study boundaries incorporate the release areas and the immediately surrounding property and are representative of exposure units. The background areas include approximate 1-acre plots within each of three background properties.

1.3.5 Develop a Decision Rule

The investigation activities include the generation of chemical and radiological data for soil. The background data will be compared to the screening levels; where background concentrations exceed the screening levels or where no screening levels exist, the background levels will be used for screening purposes. The off-site data, i.e., for the Subject Property, will be compared to the risk-based screening levels (or other) to determine the need for and scope of additional activities. The sampling and analytical methods described herein are adequate to meet these objectives.

1.3.6 Specify Limits on Decision Errors

Decision errors occur when data are misleading, resulting in selection of an inappropriate response actions. Such errors may occur as a result of sampling design error and/or measurement error. To minimize and control the potential for decision errors, this Sampling Plan utilizes MIS (which will provide reproducible data representative of the areas of interest by eliminating potential bias associated with subjective sampling and reflective of the heterogeneity of the soil and the distribution of the contaminants) and analytical methods that provide RLs, MDLs, or both that are lower than the screening levels. Sections 3 and 4 address these issues.

1.3.7 Optimize the Design for Obtaining Data

The scope of the activities described in this Sampling Plan will be able to establish anthropogenic conditions and conditions in the exposure units for evaluating potential environmental impacts associated with the three releases.

1.4 WORK PLAN FORMAT

The subsequent sections address the following subjects:

- Section 2 - constituents of potential interest
- Section 3 - MIS approach
- Section 4 - protocols and procedures for sampling and analysis
- Section 5 - analysis of the data
- Section 6 - reporting
- Section 7 - schedule

Sections 8 and 9 provide references and a list of acronyms.

2 Constituents of Interest

The constituents of interest (COIs) for which analysis will be performed are presented in Table 1. The COIs include constituents for which analysis was required in the Work Plan (inclusive of all constituents reported at concentrations above screening levels in soil samples collected pursuant to the Work Plan) and non-radiological parameters and radiological isotopes that will provide general characterization information. In summary, soil samples are to be analyzed for the following:

- **Metals**: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, magnesium, manganese, nickel, potassium, selenium, sodium, thallium, and vanadium
- **General Chemistry**: fluoride and pH
- **Radiological Parameters**: gross alpha, gross beta, radium-226 (Ra-226), Ra-228, uranium-234 (U-234), U-235, U-238, thorium-230 (Th-230), polonium-210, lead-210 (Pb-210), and potassium-40 (K-40)

The COIs do not include benzene, toluene, ethylbenzene, xylenes or total petroleum hydrocarbons which were required by the Work Plan for one area of potential concern on site. COIs do not include total phosphorous or nitrogenous compounds[2] as on-site agricultural and cattle grazing operations are expected to present data interferences. The COIs also exclude constituents not reasonably anticipated to be present above screening levels based on historical soil sample results and the nature of facility operations, feedstocks, by-products, and waste materials (e.g., mercuric chloride).

[2] The *Expanded Site Inspection Report* (Weston 1994) prepared for EPA Region 10 concluded that, "Analytical results from the sampled wells suggest that the elevated concentration of nitrate detected in the Torgesen well is not attributable to the Nu-West Industries site. A potential source of this contamination may be the cattle ranching and farming activities at or near the Torgesen ranch".

3 Multi-Incremental Sampling Approach

Background conditions and off-site soil potentially impacted by the releases will be characterized using MIS as described in this section. Section 3.1 describes the background and release area decision units (DUs) in which the sampling will be implemented; Section 3.2 provides detailed information on implementation.

3.1 DECISION UNITS

3.1.1 Background DUs

Background properties were identified based on similar current and historical use to that of the Subject Property and similar soil cover. Use of the properties was discussed in Section 1.1. The Subject Property and the background properties are in areas that were overlain with Pleistocene-age olivine basalt. The surficial soil overlying the Subject Property and South Property may be comprised to some extent of more recent deposits of calcareous tufa and travertine (USGS 1969).

Approximate 1-acre plots in each of the three background properties have been identified as DUs (Figures 7a, 7b, and 7c).

- **South Property DU** - an area near the junction of the north-south and east-west running portions of the property
- **Central Property DU** - an area in the eastern portion of the property
- **North Property DU** - an area in the south-central portion of the property

3.1.2 Off-Site DUs

Identification of the off-site DUs was based on several factors, including:

- nature of the release
- extent of the release
- exposure unit considerations

The releases were largely comprised of process water but also contained solids. Consequently, potential impacts are likely to be most notable at the surface and, particularly for the 2006 release areas, the impact associated with the solids may vary along the length of the release area due to settling.

The 2003, 2006 and 2009 release areas have been divided into nine DUs, as shown in Figures 2 through 4, and are defined below.

- **2003 Release Area - 2 DUs**
  - The on-site DU is approximately 1.7 acres, extending along the northern boundary of the West Cooling Pond and between the pond liner and the fence line.
  - The off-site DU is approximately 2.7 acres, extending west from the 2009 release area to the western limit of the West Cooling Pond (generally similar to the on-site DU) and between the fence line and the northern limit of the 2009 release.

- **2006 Release Area - 6 DUs**
  - Area A of the 2006 release area is divided into five DUs (A1 through A5), divided along the length. These five DUs range in size between 3.8 and 8.5 acres, incorporating release areas ranging between 0.6 and 2.9 acres. The largest (A3) reflects that area where soil excavation and placement of limestone/fill occurred in 2008; the smallest (A5) reflects the final segment of the release that flowed through a culvert.
  - Area B of the 2006 release is one DU is approximately 6.7 acres, incorporating an approximate 3.7-acre release area.

- **2009 Release Area - 1 DU**
  - The single 2009 DU is approximately 0.36 acre; the release area is approximately 0.31 acre.

The extents of the releases range between 0.31 acres for the 2009 release area and 20 acres for Area A. Given the relatively larger extent of Area A and potential differences in constituent distribution related to settling of solids, it was appropriate to divide this area into smaller DUs for characterization purposes.

The 2006 and 2009 DUs incorporate the footprints of the releases and adjacent areas. Consequently, data for these DUs will reflect conditions in plausible exposure areas, i.e., exposure is as likely to occur in both affected and unaffected areas. Two DUs were identified for the 2003 DUs to characterize the on-site area where the spill reportedly occurred and the adjacent off-site area; these two areas are separated by a fence which would limit exposure between both properties particularly human and larger non-avian ecological receptors.

3.2 SAMPLE LOCATIONS AND INTERVALS

MIS will be used with the intent of developing statistically defensible constituent concentrations levels for the DUs for the purpose of characterizing anthropogenic background conditions and the nature of potential impact in the release areas. In summary, the protocol requires the collection of samples from random (unbiased) locations within the decision unit (typically 30) and compositing the aliquots. The randomness of the locations and the compositing of soil from multiple locations will provide reproducible data representative of the DU by eliminating potential bias associated with subjective sampling and reflective of the heterogeneity of the soil and the distribution of the contaminants.

While the lateral extents of potential impacts are defined by the footprints of the releases, the vertical extent of potential impacts will be characterized through the collection of samples at various depth intervals.

3.2.1 Sample Locations

Consistent with MIS guidance (USACE 2009), a grid system was applied over each 1-acre background area and the release-related DUs to facilitate the collection of samples from 30 unbiased locations within each. The grid cells were adjusted based on the sizes and shapes of the DUs. Figures 7a, 7b, and 7c illustrate the background property grid areas; Figures 8, 9, and 10 illustrate the grid systems for the release area DUs.

Prior to sample collection, the corners of the DUs will be surveyed and staked; the grid lines will also be staked along the boundaries of the units. The coordinates of each grid will be uploaded into global positioning system (GPS) units (Garmin, Model GPSmap 60CSx, or similar), allowing the user to confirm and record his location as sampling proceeds.

Sample collection will commence in the northwestern-most grid and proceed in a southerly direction to the limits of the DU before turning and proceeding in a northerly direction in the adjacent line of grids, and so on to completion. The first grid cell location in each DU will be randomly identified; collection of subsequent samples will be from the same relative location within each of the other grid cells in that DU (USACE 2009). The GPS coordinates for each sample location will be recorded.

In accordance with MIS protocols, triplicate samples[3] will be collected to facilitate the calculation of the 95 percent upper confidence limit on the mean (95% UCL) concentrations for anthropogenic background and for each of the release areas (Section 5). The triplicate samples will be collected concurrent with sample collection, with both sets of samples collected from random locations initially and thereafter at the same relative locations within the other grid cells.

One set of triplicate samples will be collected from the background properties. The Southern Property has been identified for triplicate sampling based on the volume of material requiring handling and compositing and proximity to a roadway (the gravel road to the north) and site. One set of triplicate samples will be collected in each of five release areas: the on-site 2003 release area and adjacent off-site area, Areas A1 and Area B related to the 2006 release, and the 2009 release area.[4]

3.2.2 Sample Intervals and Compositing

Because the releases were comprised largely of process water which flowed overland, the greatest potential for impact is in the shallow surface soil. The maximum potential depth of impact associated with the releases is anticipated to be 4 feet below ground surface (ft-bgs) based on soil sample data collected in 2008. In recognition of the nature of the release, the potential for the greatest impact in the near surface, and to eliminate potential dilution by unimpacted soil from greater depth, surface soil samples will be collected from 0 to 2 in-bgs. Samples will then be collected from 2 to 6 in-bgs and thereafter at 6-inch increments to a total depth of 4 ft-bgs (i.e., nine sample intervals). The background and off-site sample intervals will be identical to account for potential regional conditions reflected in the soil strata.

Additionally, MIS protocols include the compositing of DU samples from the same intervals to ensure the analytical results are representative of the unit. To address compositional and distribution heterogeneity of the COIs and ensure the representative nature of the results, approximately equal volumes of soil will be collected from each interval for compositing. To

[3] The term triplicate is a misnomer: two duplicate samples are collected, yielding three sets of samples when adding the actual sample.
[4] One set of triplicate samples will be collected from the background areas.

generate composite samples for each interval in the range of 1 to 2 kilograms (EPA 2006b and USACE 2009), the individual interval samples will be a minimum of 4 ounces (to account for both radiological and non-radiological sample aliquots). The sample aliquots for individual intervals will be composited in the field (EPA 2011c) and then placed in two 1-liter containers (one each for non-radiological and radiological parameters). Triplicate samples will be similarly composited.

4 Soil Sampling and Analytical Procedures

The following sections address soil sampling and analytical procedures to be used during implementation of the Sampling Plan. Data quality assurance information is also provided herein.

4.1 SOIL SAMPLING PROCEDURES

To ensure the uniformity and quality of the data generated during implementation of the sampling Plan, all field activities will comply with EPA's Standard Operating Procedures (SOPs), including "Field Branches Quality System and Technical Procedures" (EPA 2011c), and WSP SOPs presented in the Work Plan and QAPP (WSP 2010). Soil sample collection and handling and chain-of-custody (COC) procedures, consistent with those presented in the Work Plan and the QAPP, are addressed below.

4.1.1 Sample Collection and Handling Procedures

Soil samples will be collected using direct-push (i.e., Geoprobe®) methods. Continuous soil cores will be collected at each from the ground surface to a depth of 4 ft-bgs with single-use sleeves (Standard Operating Procedure [SOP] #24, in Appendix C of the QAPP).

As noted in the preceding section, MIS soil samples will be composited in the field; compositing will be performed consistent EPA SOPs (EPA 2011c).

Composited soil samples will be placed in new, clean, laboratory-supplied, glass sample containers consistent with the method requirements (Table 2). Each sample container will be labeled with a unique label description that will include the sample identification number, date and time of sample collection, analyses to be performed, sampler's initials, and the project name and number.

Following collection, coolers for samples intended for non-radiological analyses will be placed in a cooler and chilled to approximately 4 degrees Celsius. Subsequent handling of these coolers and shipment containers for samples intended for radiological analyses will be in accordance with COC procedures.

Quality assurance/quality control samples will include blind field duplicates at a ratio of 1:10 and equipment blanks on a daily basis (SOP #21, Appendix C of the QAPP). Due to the stepped approach to sample analysis and the potential that the majority of samples collected from the subsurface will not be analyzed (Section 4.2), all of the duplicates will be collected from the 0 to 2 in-bgs and 2 to 6 in-bgs intervals. The analytical parameter list for the duplicates will be identical to that for the samples. Equipment blanks will only be required for tools used in compositing because the sample equipment is single use. The analytical parameter list for the equipment blanks will include non-radiological parameters, gross alpha, and gross beta.

Down-hole portions of the direct-push equipment will be decontaminated between each boring location. Decontamination will include the use of a phosphate-free detergent, such as Liquinox® (SOPs #15 and #19, Appendix C of the QAPP).

4.1.2 Chain-of-Custody Procedures

COC procedures consist of several levels of documentation, including the field logbook, the COC form, and custody seals which serve as the record for tracking sample collection and transport. Once a sample is obtained, it must be maintained under COC procedures until it is in the custody of the analytical laboratory. The person collecting the sample is responsible for the custody of the sample until it is properly transferred or dispatched.

- Field Log Book - The field logbook serves as official documentation of sampling activities. Field logbooks will be constructed of bound, sequentially numbered, water-resistant notepaper, and records will be kept in waterproof ink. Field personnel shall make frequent detailed entries to provide an adequate record of activities conducted during each day on site. SOP #1, Appendix C of the QAPP, provides additional details of required protocol for the field logbook.

- COC Form - A COC form will be filled out simultaneous with sample collection or at the end of each day.

  The original COC form will remain with the samples until their ultimate disposal; one copy of the COC form will be retained by the sampler. The receiving laboratory will sign the original COC form and return one copy with the analytical data package.

  The COC form will include the carrier airbill number (in lieu of a custody signature). The sampler's copy of the air bill will be affixed to this COC form and will become a part of the COC documentation.

- Custody Seals - To complete custody procedures for shipping, each sample cooler or container will be sealed with custody seals signed and dated by the shipper. If broken during transit, the sample custody will be considered compromised (i.e., potential tampering during transit); if unbroken, the integrity of the samples is assumed to be maintained.

4.2 ANALYTICAL PROTOCOLS

Table 2 summarizes the analytical methods (as presented in the Site Work Plan), detection and reporting limits, screening levels, and analytical requirements (e.g., holding time). On receipt of the composited samples, the laboratory will utilize SW-846 Method 8330B (EPA 2006b). This method includes air-drying of the samples, removal of large material (e.g., pebbles, stones, sticks), sieving, prior to subsampling. The objective of these activities, particularly the removal of large material and sieving is to reduce uncertainty in the results that might reflect analysis of larger material that might not be representative of conditions. Subsampling is performed to provide 30 sample aliquots of similar nature for analysis by different methods; further uncertainty is further reduced by using larger than usual sample aliquots (i.e., 10 grams in lieu of 2 grams).

Comparison of the MDLs and laboratory reporting limits RLs indicates (Table 2) that these limits are higher than the screening levels only for Ra-226, Ra-228, Th-230, Pb-210, and K-40. Consequently, the methods are sufficient for the purpose of data analysis (Section 5) for most COIs and parameters for general characterization. The lower screening levels for the radiological parameters, relative to the MDLs and RLs, is not believed to be of concern because background levels of radiation are anticipated to be higher than the screening levels; regardless, there is no available standard method that provides better limits.

All of the samples collected from 0 to 2 in-bgs and 2 to 6 in-bgs will be analyzed on receipt; samples from the remaining intervals will be held.[5] Following calculation of concentrations in the DUs, based on sample and triplicate results (Section 5), a comparison with the screening levels will be performed. If the calculated concentration for the 2 to 6 in-bgs sample aliquot from any DU exceeds a human health or ecological screening level, the sample from the next deepest interval (0.5 to 1 ft-bgs) will be analyzed, and so on until the concentration is below the screening level.

Analysis for non-radiological parameters will be performed through Accutest Laboratories, Inc., Denver, Colorado; analysis for radiological parameters will be performed by ALS Environmental, Fort Collins, Colorado. Quality Assurance Manuals for both laboratories are appended to the QAPP. The laboratories will supply electronic data deliverables that will be incorporated into the existing database and downloaded into the project data tables using Electronic Records Information Management System WSP's proprietary data management tool.

The data packages for the conventional chemical parameters will be Level III with deliverables similar to those required by EPA's contract laboratory program. In accordance with the Work Plan, approximately 20 percent of the data packages will be validated by a third party validator consistent with EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA 2004a); radiological data will be validated in pursuant to the Multi-Agency Radiological Laboratory Analytical Protocols Manual (EPA 2004b).

[5] In the event the surficial soil samples are largely comprised of limestone or other discernible fill material, the next deeper sample will also be initially submitted for laboratory analysis to address the potential that the surficial material result are "masking" residual impacts in the subsurface.

5 Screening Activities

The various steps in the data screening process are described in the following sections.

5.1 SAMPLE CONCENTRATIONS

The background and off-site soil sample results will be used to develop concentrations for non-radiological and radiological parameters for comparison with one another and with the screening levels. The concentrations will be developed following these MIS protocols:

- MIS samples will be collected from each of the three background and nine release-area DUs
- Triplicate MIS samples will be collected from these DUs:
  - Background - South Property
  - Release Areas
    - 2003 on and off site
    - 2006 Area A1 and Area B
    - 2009 DU
- The MIS results for the background properties will be averaged; the triplicate results for the South Property will be used to calculate the mean, variance, standard deviation (SD), and 95% UCL for background
- The MIS and triplicate MIS results for the six release areas will be used to calculate the mean, variance, SD, and 95% UCL for each
- The triplicate MIS results for Area A1 and the MIS results for Areas A2 through A5 will be used to calculate the mean, variance, SD, and 95% UCL for these four remaining 2006 release areas

5.2 SCREENING LEVELS

Section 5.2.1 and 5.2.2 identify the human health and ecological screening levels. Section 5.3 discusses the screening level process including potential use of background concentrations in lieu of the levels discussed below.

5.2.1 Human Health Screening Levels

The screening levels include those for human health for residential and industrial exposure pathways and ecological screening levels.

The human health screening levels for non-radiological parameters are the EPA regional screening levels (RSLs; EPA 2011d). With the exception of total uranium, the EPA preliminary screening goals (PRGs; EPA 2010) will be used for comparison with radiological data. The total uranium results will be compared to the non-carcinogenic RSL which is lower than the PRG.[6]

[6] The results for U-234, U-235, and U-238 analysis will be converted from picocuries per gram (pCi/g) to milligrams per kilogram (mg/kg), for comparison with the RSL, using these conversion factors:

U-234, 1 pCi/g = 1.64×10^{-4} mg/kg

Table 3a presents the human health screening levels. Screening levels for the carcinogenic parameters are based on a cancer risk of 1 x 10^{-6}; EPA's acceptable risk range is typically 1 x 10^{-4} to 1 x 10^{-6}. The screening levels for non-carcinogens are based on target hazard quotients of 1.0; to account for cumulative adverse effects the screening levels are based on a target hazard quotient of 0.1 (i.e., the screening levels in the table are 1/10^{th} that provided in the guidance).

5.2.2 Ecological Screening Levels

The ecological screening levels include the EPA's Ecological Soil Screening Levels (Eco-SSLs) for terrestrial plants, soil invertebrates, and avian and mammalian wildlife (EPA 2005). The Eco-SSLs are provided in Table 3b. Screening level benchmarks developed by the Oak Ridge National Laboratory (ORNL) will be used where Eco-SSLs are not available: thallium, fluoride, nitrate, (non-carcinogenic) uranium (ORNL 2003). The ORNL for uranium is presented in Table 3c. The values shown for wildlife for the remaining parameters are for intake (food) and not directly related to soil concentrations; therefore, plant uptake factors need to be applied to site-specific soil concentrations (to be obtained) for comparison to these benchmarks.

The primary objectives of the Sampling Plant are to determine: (1) if constituents of potential interest are present at concentrations in one or more of the release areas at concentrations greater than anthropogenic background, i.e., some impact has occurred; (2) of constituents present at concentrations above background levels pose an unacceptable risk to human health or the environment; and (3) do conditions warrant further evaluation.

5.3 SCREENING LEVEL PROCESS

To determine if impact occurred from any of the releases occurred, a comparison of the 95% UCL concentrations for background and the individual release area DUs will performed. Exceedences of background concentrations will be indicative of potential impact but will not trigger further action.

To ensure that regional soil conditions are taken into account, the background 95% UCL will be compared to the human health and ecological screening levels. In instances where the background concentrations are higher, the background levels will replace the screening levels.

To evaluate potentially unacceptable risk associated with the release areas, the 95% UCLs for the DUs will be compared to the screening levels. As discussed in Section 4, all of the samples collected from 0 to 2 in-bgs and 2 to 6 in-bgs will be analyzed on receipt. If the calculated concentration for the 2 to 6 in-bgs sample aliquot from any DU exceeds a human health or ecological screening level, the sample from the next deepest interval (0.5 to 1 ft-bgs) will be analyzed, and so on until the concentration is below the screening level and the extent of impact delineated.

U-235, 1 pCi/g = 4.6 x 10^{-1} mg/kg
U-238, 1 pCi/g = 2.98 mg/kg

6 Reporting

On receipt of the background soil data, it will be evaluated as discussed in the preceding sections to ascertain the 95% UCL concentrations for all parameters. These values will then be compared to the default screening levels to determine the final screening values. A letter report will be submitted to the EPA which provides the appropriate supporting data and information, presents the 95% UCL concentrations for background and presents the final screening values. Upon approval by the EPA, the data for the release area DUs will be compared to the background data to evaluate potential impacts, and compared to the screening values to determine the need for analysis of samples collected from depths greater than 0.5 ft-bgs.

These findings and additional relevant data and information generated through implementation of the Sampling Plan will be summarized and presented in a report to the EPA. At a minimum, the report will include the following:

- a summary of all tasks completed, including documentation of conformance with protocols
- re-evaluation and potential refinement of the preliminary conceptual site model, including constituent fate and transport beyond the facility boundary
- figures illustrating:
  - the known footprints of the 2003, 2006, and 2009 release areas
  - background and release area grid systems and sample locations
  - DU sample results exceeding screening levels at various depths
- tables including:
  - the background and release area sample and triplicate results
  - screening levels
  - results of the comparison of the background and release area data
  - results of the comparison of the screening levels and release area data

The report will also include laboratory results and any relevant photographs.

7 Schedule

A preliminary schedule developed for the background and off-site sampling activities and reporting is provided in Figure 11. The start date for the field activities is 3 weeks after receipt of EPA's approval of this Sampling Plan, contingent on completion of harvesting within the background properties, driller availability, and weather permitting for the duration of the field work. As shown in the schedule, background samples will be collected first followed by sampling on the Subject Property.

The schedule includes assimilation and manipulation of the background data in support of the screening activities, submittal of the letter report presenting the background UCL concentrations and screening levels, and review and approval periods for this submittal.

The schedule includes the initial comparison of data for the release area DU samples from 2 to 6 in-bgs. Based on the findings (i.e., exceedences of screening levels), laboratory analysis of samples collected from the next deeper interval may then be performed. The schedule assumes this iterative process will be complete for all DUs at 2.5 ft-bgs for non-radiological parameters and 1.5 ft-bgs for radiological parameters. The actual schedule will be modified as appropriate based on the results of the screening activities.

8 References

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9 Acronyms

COC	chain-of-custody
COI	constituents of interest
CPO	Conda Phosphate Operation
DQO	data quality objectives
DU	decision unit
Eco-SSL	ecological soil screening level
EPA	U.S. Environmental Protection Agency
GPS	global positioning system
IDEQ	Idaho Department of Environmental Quality
MDL	method detection limit
MIS	multi-incremental sampling
ORNL	Oak Ridge National Laboratory
PRG	preliminary screening goals
QAPP	Quality Assurance Project Plan
RL	reporting limit
RSL	regional screening level
SD	standard deviation
SOP	Standard Operating Procedure
TRG	target remediation goals
UCL	upper confidence limit

Figures

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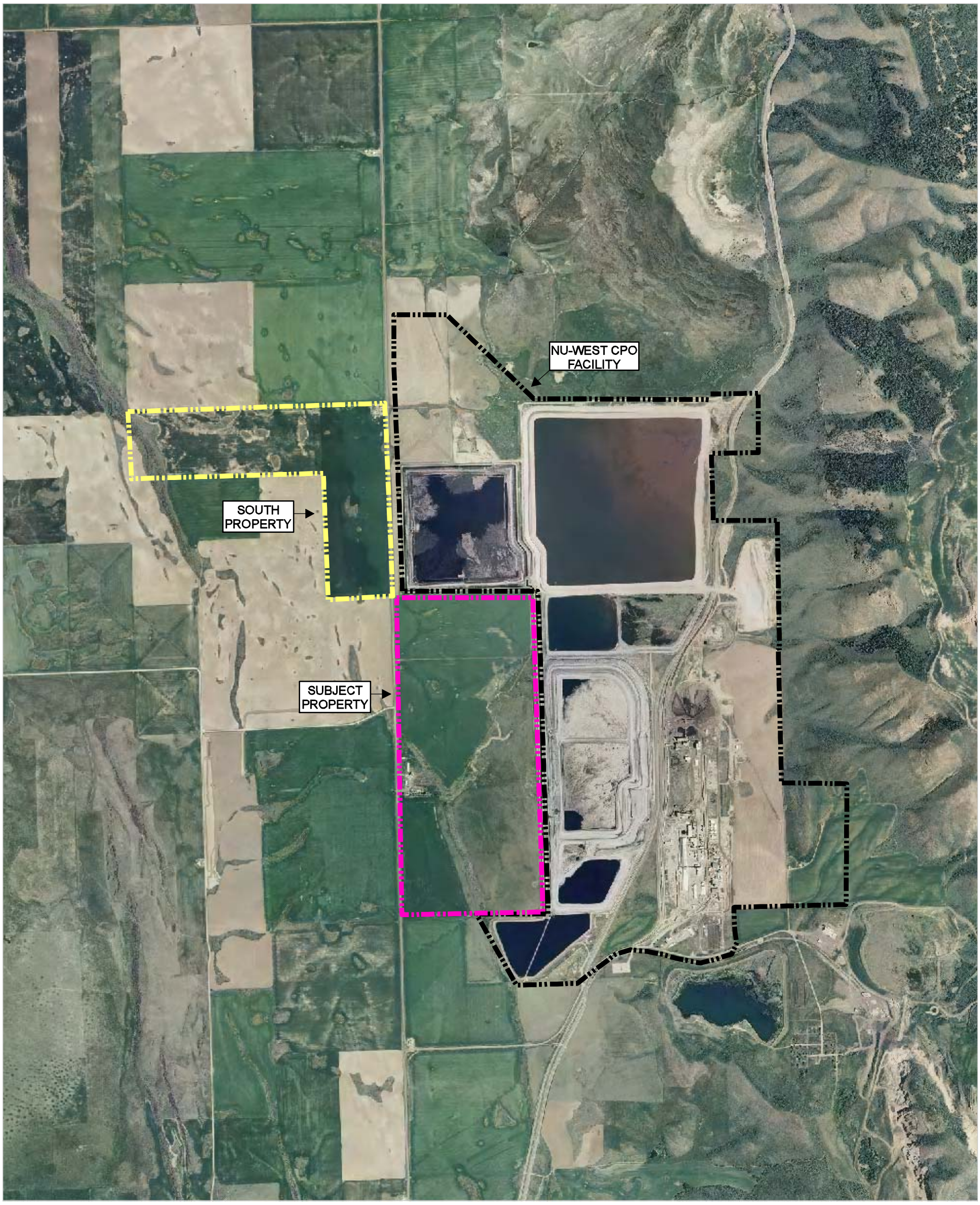

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REFERENCE: http://cloud.insideidaho.org/index.html NAIP, 2009 1-METER NATURAL COLOR ORTHOIMAGERY FOR IDAHO

LEGEND

APPROXIMATE LOCATI0N OF PROPERTY BOUNDARY

APPROXIMATE FACILITY PROPERTY BOUNDARY

APPROXIMATE SUBJECT PROPERTY PROPERTY BOUNDARY

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FIGURE 1

CPO FACILITY, SUBJECT PROPERTY, AND SOUTH PROPERTY

NU-WEST INDUSTRIES, INC.
SODA SPRINGS, IDAHO

PREPARED FOR

NU-WEST INDUSTRIES, INC.
SODA SPRINGS, IDAHO

Drawn By: CEP 092011

Checked:

Approved:

MXD Name: 4180 ARCB10

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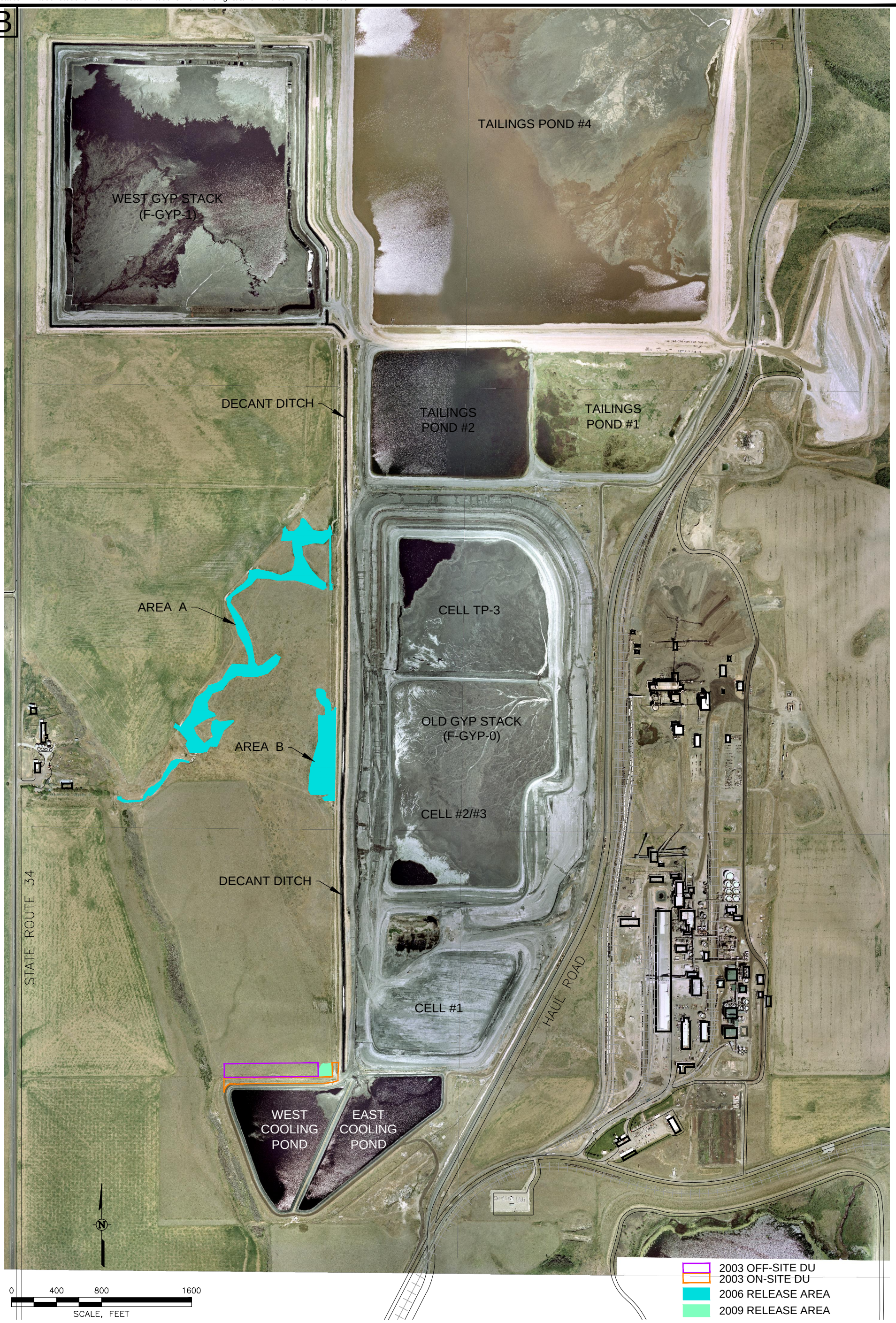

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FIGURE 2

RELEASE AREAS

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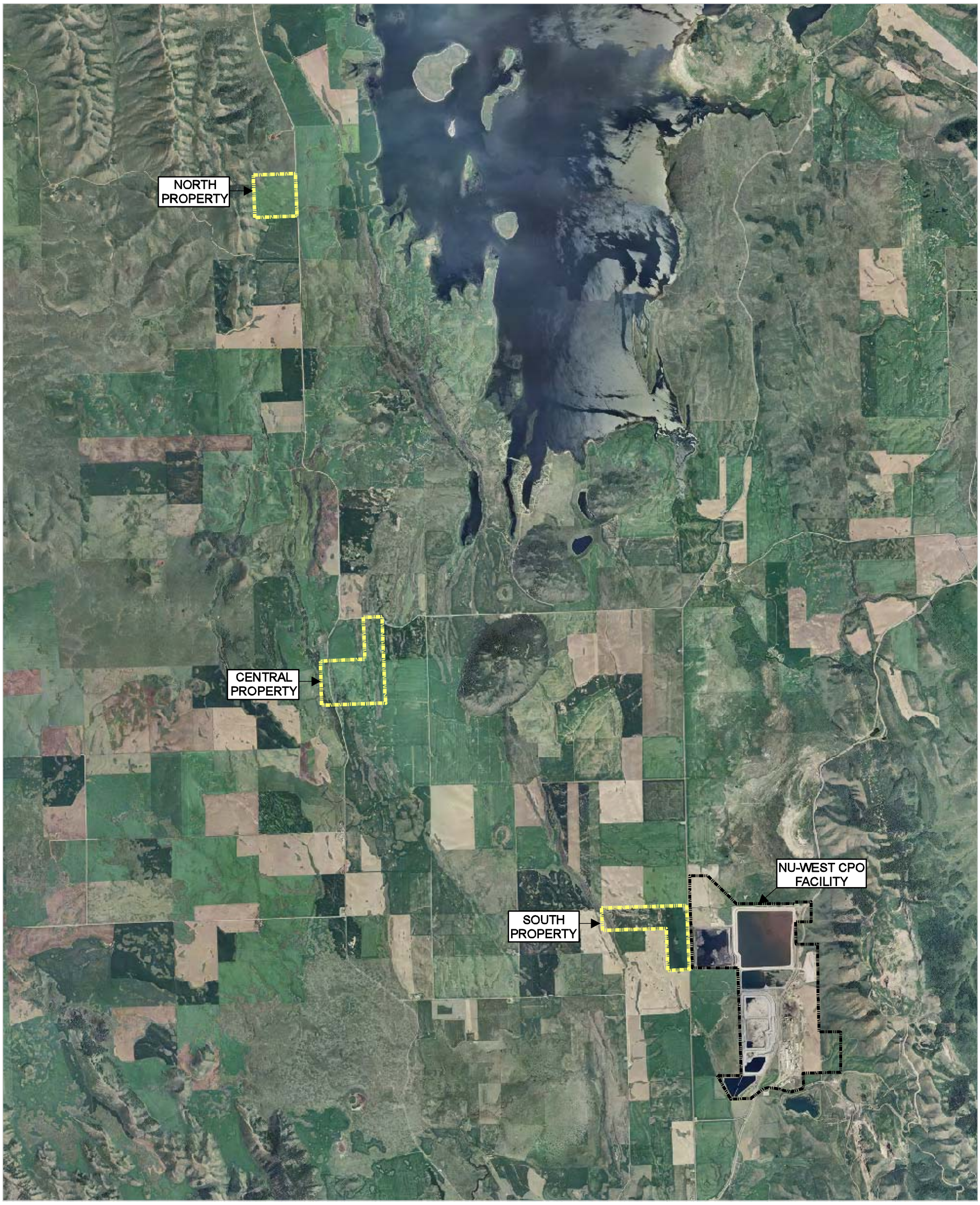

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SCALE IN FEET

LEGEND

APPROXIMATE LOCATION OF PROPERTY BOUNDARY

APPROXIMATE FACILITY PROPERTY BOUNDARY

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FIGURE 3

BACKGROUND LOCATIONS

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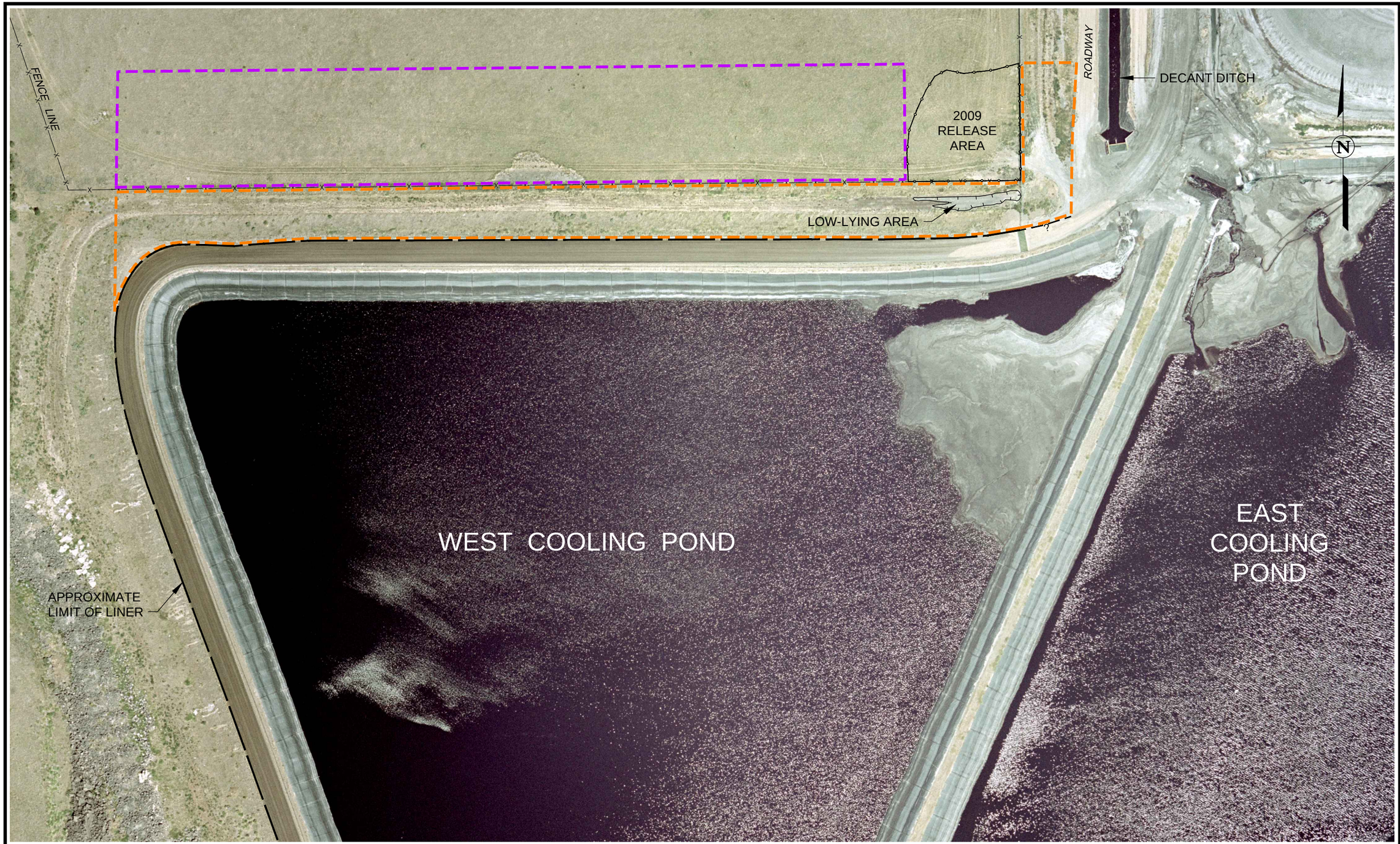

LEGEND

OFF-SITE DU

ON-SITE DU

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SCALE, FEET

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DWG Name: 00023229-B01

NU-WEST INDUSTRIES, INC.
SODA SPRINGS, IDAHO

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Nu-WEST INDUSTRIES, INC.
SODA SPRINGS, IDAHO

FIGURE 4

NOVEMBER 2003 RELEASE AREA

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AREA A

A3

A4

AREA B

A5

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SCALE, FEET

LEGEND

DECEMBER 2006 RELEASE AREA

AREAS EXCAVATED IN 2008

DECISION UNIT

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FIGURE 5

DECEMBER 2006 RELEASE AREA

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SODA SPRINGS, IDAHO

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FIGURE 6

APRIL 2009 RELEASE AREA

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SODA SPRINGS, IDAHO

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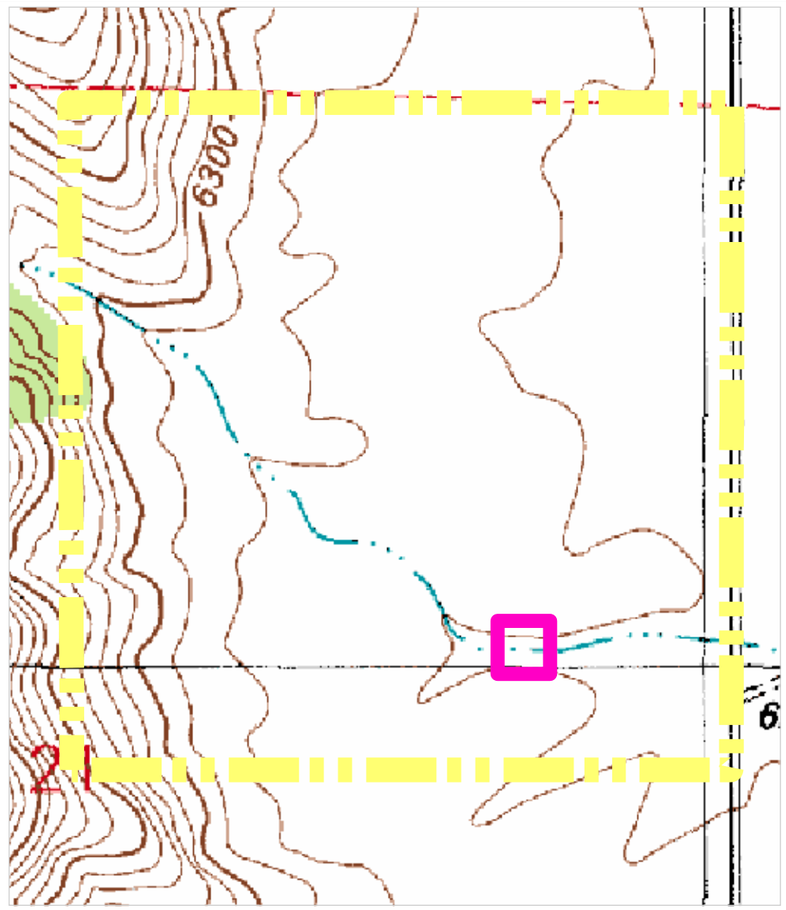

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LEGEND

APPROXIMATE BACKGROUND PROPERTY BOUNDARY

APPROXIMATE MIS SAMPLING AREA

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Feet

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SODA SPRINGS, IDAHO

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NU-WEST INDUSTRIES, INC.
SODA SPRINGS, IDAHO

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Approved:
MXD Name: 4180 ARCB06

FIGURE 7a

NORTH PROPERTY, MIS SAMPLE GRID AREA

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LEGEND

APPROXIMATE BACKGROUND PROPERTY BOUNDARY

APPROXIMATE MIS SAMPLE AREA

REFERENCES:
1) http://cloud.insideidaho.org/index.html NAIP, 2009 1-METER NATURAL COLOR ORTHOIMAGERY FOR IDAHO
2) USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, THE DIP, IDAHO, 1:24,000, 1981.

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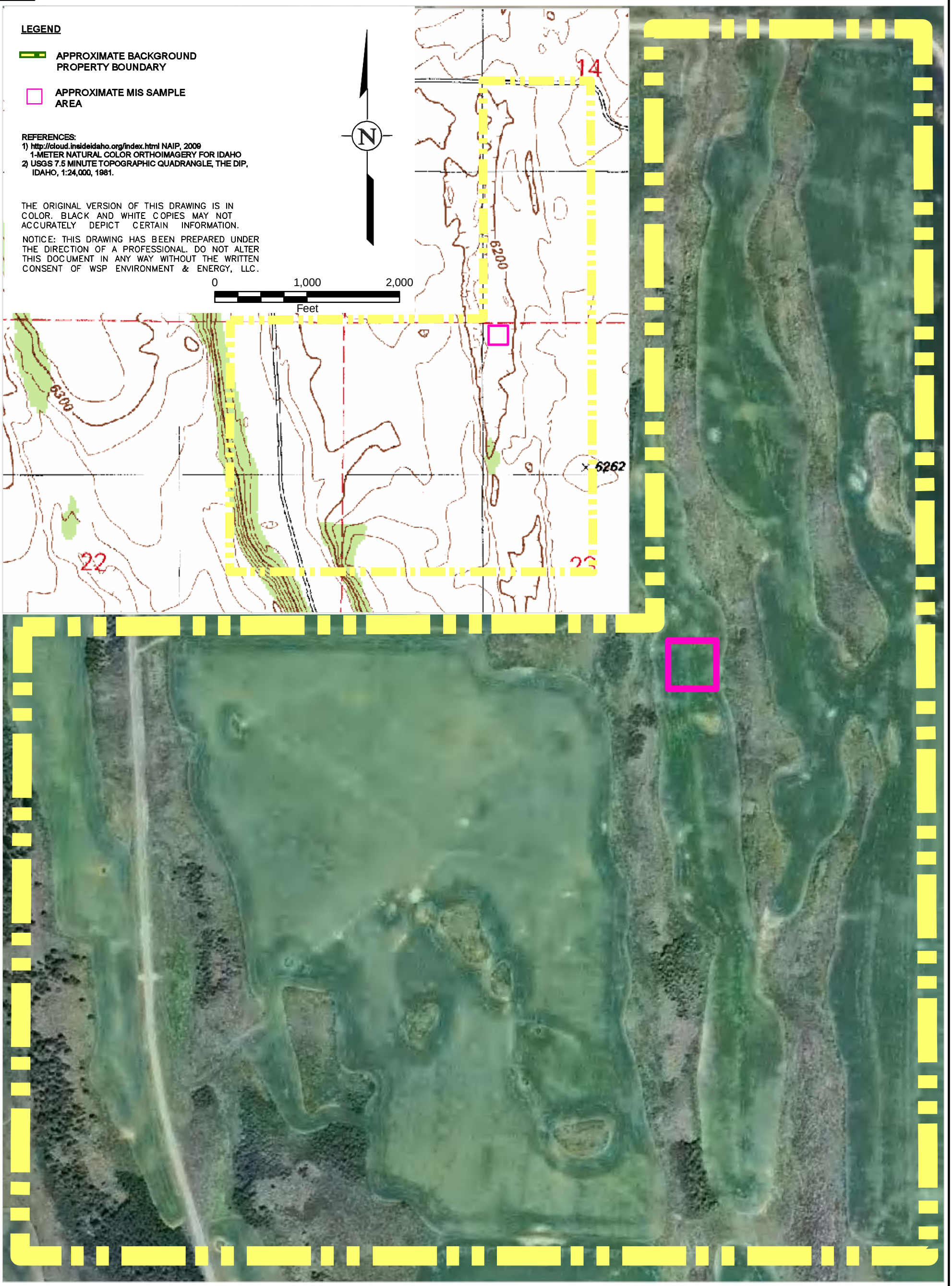

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Figure 7b

CENTRAL PROPERTY, MIS SAMPLE GRID AREA

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SODA SPRINGS, IDAHO

Drawn By: CEP 091911
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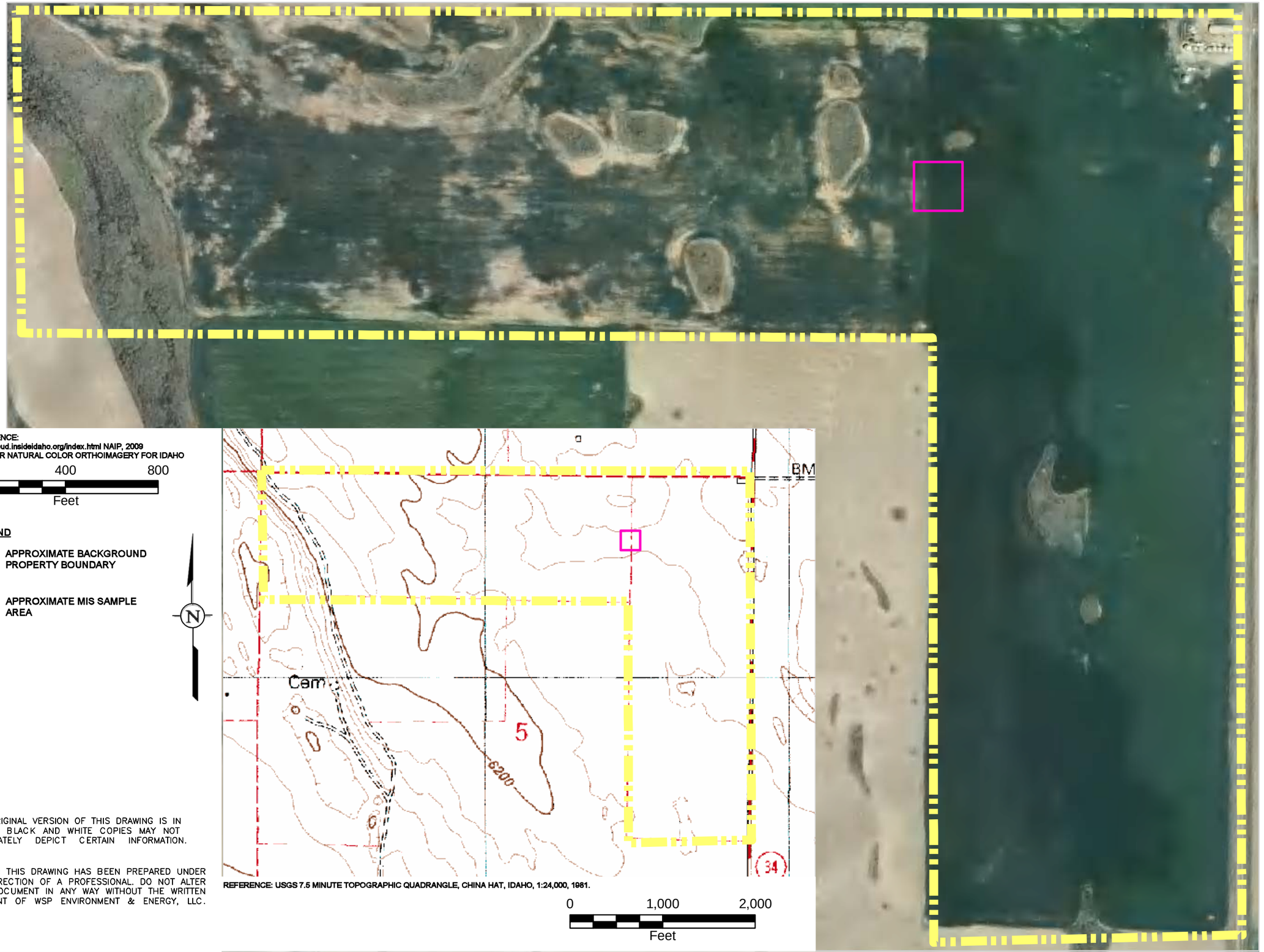
MXD Name: 4180ARCB08



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APPROXIMATE BACKGROUND PROPERTY BOUNDARY

APPROXIMATE MIS SAMPLE AREA

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REFERENCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, CHINA HAT, IDAHO, 1:24,000, 1981.

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NU-WEST INDUSTRIES, INC.
SODA SPRINGS, IDAHO
PREPARED FOR
NU-WEST INDUSTRIES, INC.
SODA SPRINGS, IDAHO

FIGURE 7c

SOUTH PROPERTY, MIS SAMPLE GRID AREA

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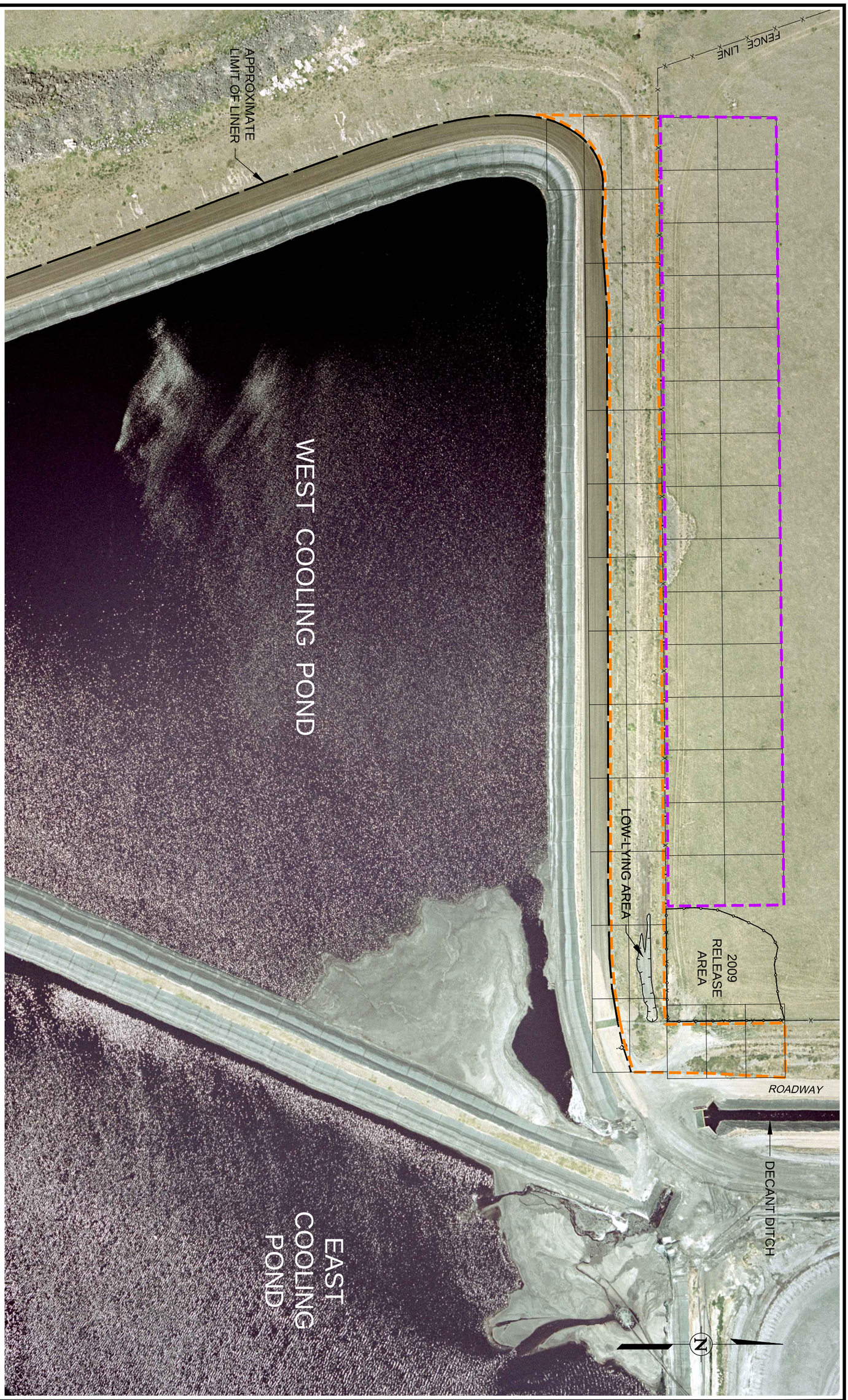

LEGEND

OFF-SITE DU

ON-SITE DU

MIS SAMPLE GRID

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SCALE: FEET

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FIGURE 8

NOVEMBER 2003 RELEASE AREA
MIS SAMPLE GRID

NU-WEST INDUSTRIES, INC.
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SODA SPRINGS, IDAHO

Drawn By: RAZ 9/8/2011

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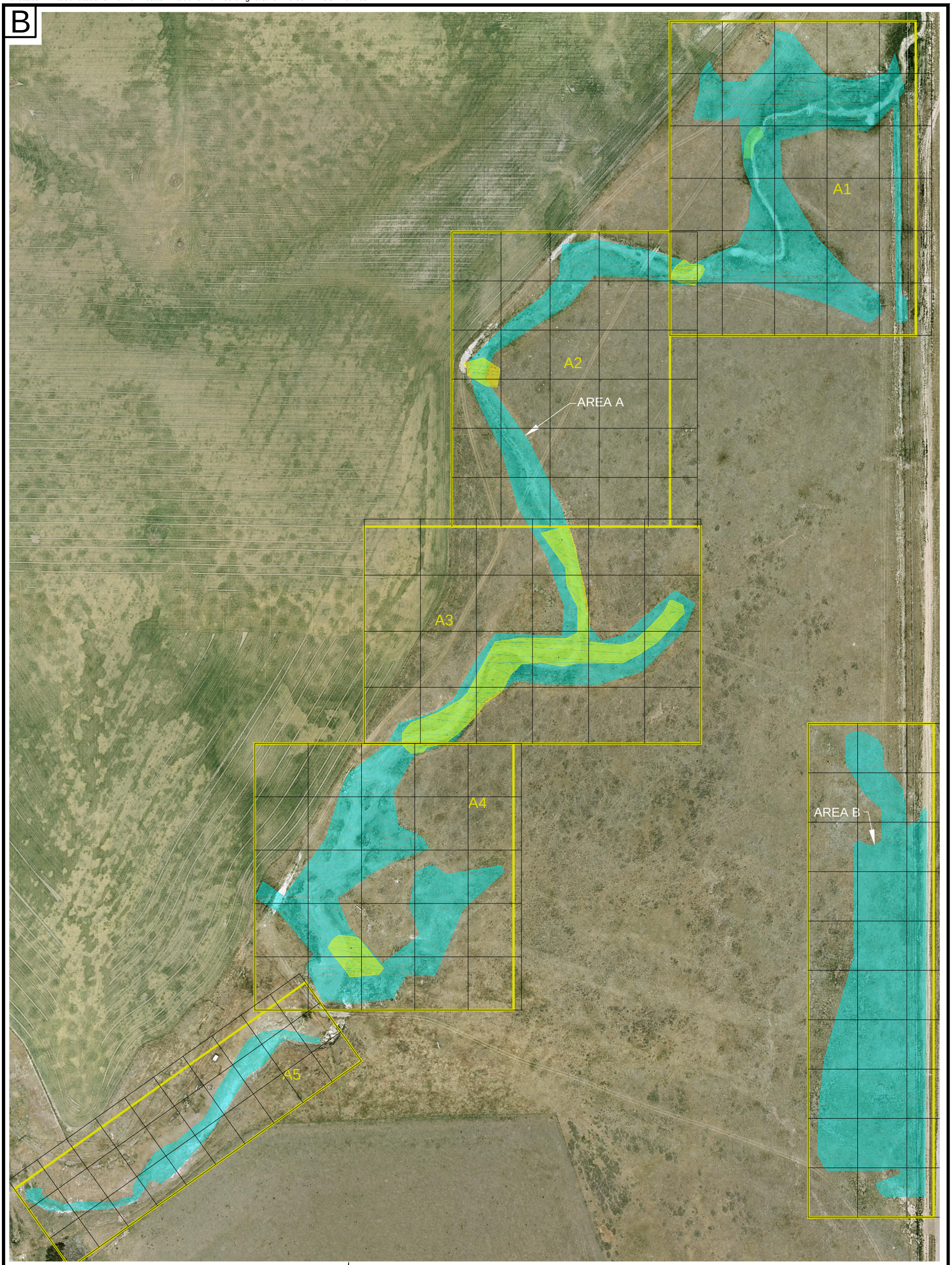

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SCALE, FEET

LEGEND
- DECEMBER 2006 RELEASE AREA
- AREAS EXCAVATED IN 2008
- DECISION UNIT
- MIS SAMPLE GRID

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FIGURE 9

DECEMBER 2006 RELEASE AREA
MIS SAMPLE GRID

NU-WEST CPO
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SODA SPRINGS, IDAHO

Drawn By: JME 08022011
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DWG Name: 00023229-B03c

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Reference: Drawing 09-01-223
Drawn by Agrium, April 27, 2009

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LEGEND

APRIL 2009 RELEASE AREA

DECISION UNIT

MIS SAMPLE GRID

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FIGURE 10

APRIL 2009 RELEASE AREA
MIS SAMPLE GRID

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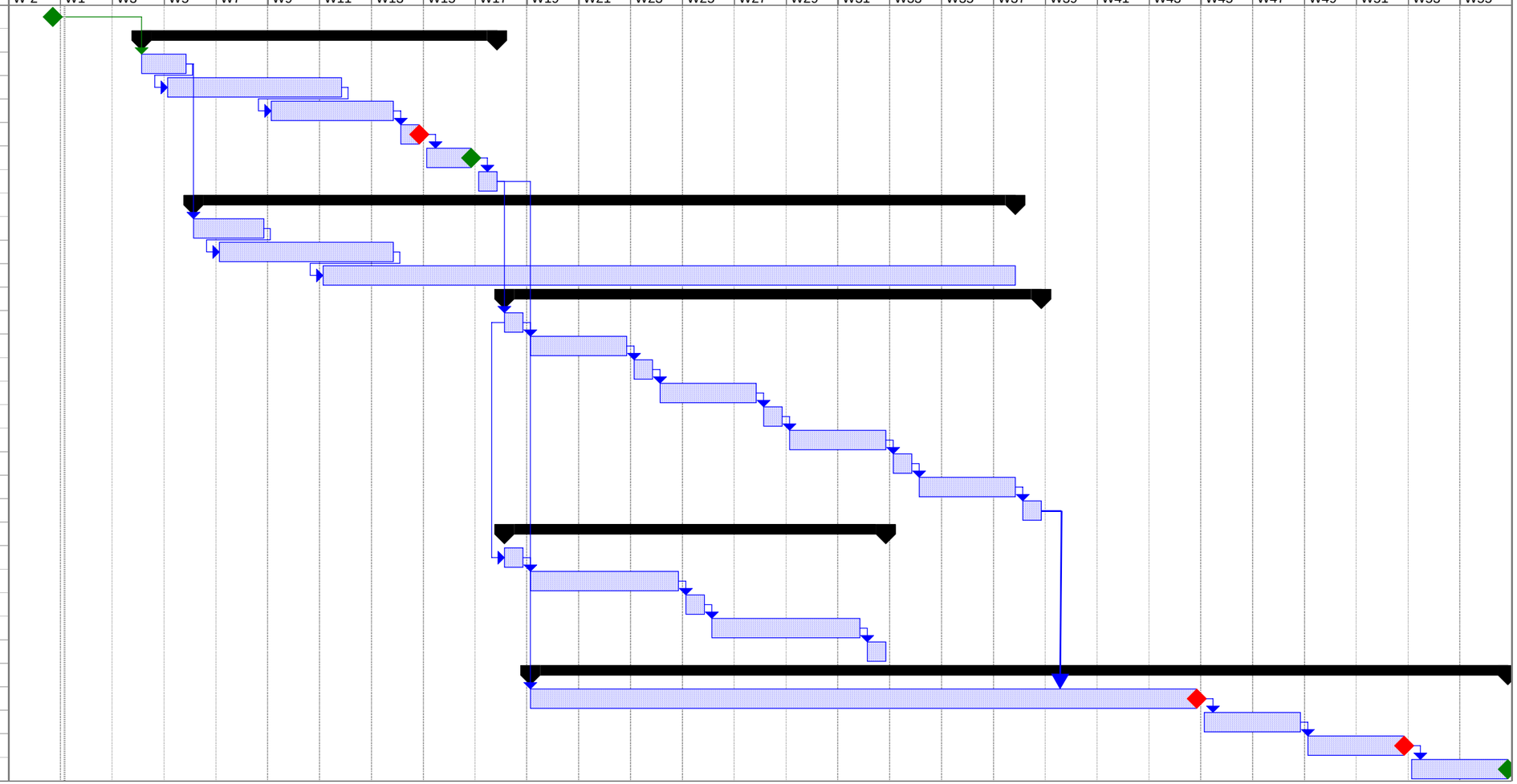
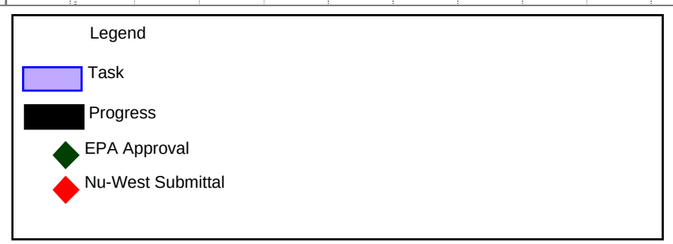
NU-WEST INDUSTRIES, INC.
SODA SPRINGS, IDAHO

Drawn By: JME 08022011
Checked:
Approved:
DWG Name: 00023229-B03d

Figure 11
Schedule
Off-Site Soil Sampling Plan
Conda Phosphate Operations Facility
Soda Springs, Idaho

ID	Task Name
1	EPA Approval
2	**Background Activities**
3	Background Fieldwork
4	Laboratory Analysis
5	Data Management/Analysis
6	Background Concentration Proposal to EPA
7	EPA Review
8	Finalize Background Concentrations
9	**Release Area Activities**
10	Release Area DU Fieldwork
11	Laboratory Analysis (0 to 0.2 and 0.2 to 0.5 ft)
12	Data Management/Analysis
13	**Non-Rad Data Steps**
14	Compare 0.2 to 0.5 ft. data with screening levels
15	Laboratory Analysis (0.5 to 1 ft.)
16	Compare 0.5 to 1 ft. data with screening levels
17	Laboratory Analysis (1 to 1.5 ft.)
18	Compare 1 to 1.5 ft. data with screening levels
19	Laboratory Analysis (1.5 to 2 ft.)
20	Compare 1.5 to 2 ft. data with screening levels
21	Laboratory Analysis (2 to 2.5 ft.)
22	Compare 2 to 2.5 ft. data with screening levels
23	**Rad Data Steps**
24	Compare 0.2 to 0.5 ft. data with screening levels
25	Laboratory Analysis (0.5 to 1 ft.)
26	Compare 0.5 to 1 ft. data with screening levels
27	Laboratory Analysis (1 to 1.5 ft.)
28	Compare 1 to 1.5 ft. data with screening levels
29	**Reporting**
30	Draft Report Preparation
31	EPA Review
32	Revised Report Preparation
33	EPA Review





Project: Nu-West_Sch_091611
Date: 9/19/11

Tables

Table 1

Summary of Analytical Parameter Lists and Exceedences
Off-Site Soil Sampling Plan
Nu-West Industries, Inc.
Conda Phosphate Operations Facility
Soda Springs, Idaho (a)

Parameters	On-Site Soil Screening Level Exceeds (b)	Site Work Plan Soil Analytical List (c)	Proposed Off-Site Soil Analytical Program	Reason for Inclusion/ (Exclusion)
TAL metals				
Aluminum	na	-	X	general characterization
Antimony	X	X	X	on-site soil exceeds
Arsenic	X	X	X	on-site soil exceeds
Barium	X	X	X	on-site soil exceeds
Beryllium	X	X	X	on-site soil exceeds
Cadmium	X	X	X	on-site soil exceeds
Calcium	nsl	X	X	Site Work Plan requirement
Chromium (total)	-	X	X	Site Work Plan requirement
Cobalt	na	-	-	excluded from Site Work Plan
Copper	na	-	-	excluded from Site Work Plan
Iron	na	-	X	general characterization
Lead	X	X	X	on-site soil exceeds
Magnesium	nsl	X	X	Site Work Plan requirement
Manganese	na	-	X	general characterization
Mercury	-	-	-	excluded from Work Plan and no on-site exceeds
Nickel	X	X	X	on-site soil exceeds
Potassium	nsl	X	X	Site Work Plan requirement
Selenium	X	X	X	on-site soil exceeds
Silver	na	-	-	excluded from Site Work Plan
Sodium	-	X	X	Site Work Plan requirement
Thallium	X	X	X	on-site soil exceeds
Vanadium	X	X	X	on-site soil exceeds
Zinc	na	-	-	excluded from Site Work Plan
General Chemistry				
Fluoride (total)	X	X	X	on-site soil exceeds
pH	nsl	X	X	Site Work Plan requirement
Radiological Parameters				
Gross alpha	nsl	X	X	Site Work Plan requirement
Gross beta	nsl	X	X	Site Work Plan requirement
Radium-226	X	X	X	on-site soil exceeds
Radium-228	-	X	X	Site Work Plan requirement
Uranium-238	na	-	X	general characterization
Uranium-235	na	-	X	general characterization
Uranium-234	na	-	X	general characterization
Thorium-230	na	-	X	general characterization
Polonium-210	na	-	X	general characterization
Lead-210	na	-	X	general characterization
Potassium-40	na	-	X	general characterization

a/ TAL = target analyte list; N = nitrogen;
"-" indicates parameter not detected above screening level in site soil sample or not required by the Site Work Plan;
"X" indicates parameter included in detected above screening level in site soil sample or required by the Site Work Plan;
"na" indicates analysis not performed;
"nsl" indicates no screening level.
b/ Sample results for 2010 site investigation.
c/ WSP Environment & Energy's Sampling and Analysis Work Plan for Site Characterization (2010).

Table 2

Soil Sample Analytical Methods and Requirements
Off-Site Soil Sampling Plan
Nu-West Industries, Inc.
Conda Phosphate Operations Facility
Soda Springs, Idaho (a)

Parameters	Test Method (b)	Method Detection Limit (mg/kg)	Laboratory Reporting Limit (mg/kg)	Human Health Screening Levels for Soil: EPA RSL Residential (c)	Human Health Screening Levels for Soil: EPA RSL Industrial (c)	Human Health Screening Levels for Soil: IDEQ REM IDTL/ Critical Pathway (d)	Lowest of EPA Ecological SSLs (e)	Ecological Screening Benchmark Reports (f)	Sample Requirements: Container	Sample Requirements: Quantity (grams)	Sample Requirements: Preservative	Sample Requirements: Holding Time
Metals (mg/kg)												
Aluminum	SW-846 6010C	1.2	10	77,000 n	99,000 nm	-	- (g)	-	G	100	none	180 days
Antimony	SW-846 6010C	0.1	1	31 n	41 n	-	0.27	-	G	100	none	180 days
Arsenic	SW-846 6010C	0.1	0.5	0.39 c	1.6 c	-	18	-	G	100	none	180 days
Barium	SW-846 6010C	0.5	10	15,000 n	19,000 nm	-	330	-	G	100	none	180 days
Beryllium	SW-846 6010C	0.05	0.25	150 n	200 n	-	21	-	G	100	none	180 days
Cadmium	SW-846 6010C	0.05	0.2	70 n (h)	800 n (h)	-	0.36	-	G	100	none	180 days
Calcium	SW-846 6010C	5	250	- (i)	- (i)	-	- (i)	-	G	100	none	180 days
Chromium (total)	SW-846 6010C	0.05	0.5	120,000 nm	150,000 nm	-	26 (j)	-	G	100	none	180 days
Iron	SW-846 6010C	1.7	15	55,000 n	72,000 nm	-	- (k)	-	G	100	none	180 days
Lead	SW-846 6010C	0.05	1	400	800 n	-	11	-	G	100	none	180 days
Magnesium	SW-846 6010C	5	250	- (i)	- (i)	-	- (i)	-	G	100	none	180 days
Manganese	SW-846 6010C	0.05	0.75	1,000 n (h)	23,000 n (h)	-	220	-	G	100	none	180 days
Nickel	SW-846 6010C	0.05	2	1,500 n	2,000 n	-	38	-	G	100	none	180 days
Potassium	SW-846 6010C	25	500	- (i)	- (i)	-	- (i)	-	G	100	none	180 days
Selenium	SW-846 6010C	0.2	1	390 n	510 n	-	0.52	-	G	100	none	180 days
Sodium	SW-846 6010C	55	500	- (i)	- (i)	-	- (i)	-	G	100	none	180 days
Thallium	SW-846 6010C	0.13	0.5	0.78 n	1 n	-	- (i)	-	G	100	none	180 days
Vanadium	SW-846 6010C	0.05	2.5	390 n	520 n	-	7.8	-	G	100	none	180 days
General Chemistry (mg/kg)												
Fluoride (total)	EPA 9056A	1	0.5	3,100 n	4,100 n	-	-	-	G	100	4°C	28 days
pH (s.u.)	SW-846 9045D	0.01	0.01	- (i)	- (i)	-	- (g,k)	-	G	100	4°C	ASAP
Radiological Parameters (pCi/g) (c)												
Gross alpha	EPA 900	NA	3	- (i)	- (i)	-	-	-	G or Poly	30	None	NA
Gross beta	EPA 900	NA	4	- (i)	- (i)	-	-	-	G or Poly	30	None	NA
Radium-226	EPA 901.1M/HASL-300	NA	1	0.199 / 0.0121 c (l)	3.28 / 0.023 c (l)	-	-	-	G or Poly	250	None	NA
Radium-228	EPA 901.1M/HASL-300	NA	1	0.269 / 0.0292 c (l)	7.56 / 0.0484 c (l)	-	-	-	G or Poly	250	None	NA
Uranium-238	ASTM D3972-09	NA	0.1	4.02 c	29.1 c	-	-	-	G or Poly	30	None	NA
Uranium-235	ASTM D3972-09	NA	0.1	0.192 / 3.95 c (l)	0.348 / 30.9 c (l)	-	-	-	G or Poly	30	None	NA
Uranium-234	ASTM D3972-09	NA	0.1	4.48 / 0.696 c (l)	33.0 / 1.49 c (l)	-	-	-	G or Poly	30	None	NA
Uranium (mg/kg)	ASTM D3972-09 (m)	NA	NA	23 n	310 n	-	-	5 (n)	G or Poly	30	None	NA
Thorium-230	ASTM D3972-09	NA	0.1	3.46 c	18 c	-	-	-	G or Poly	30	None	NA
Polonium-210	ASTM D3972-09	NA	0.25	38.2 c	245 c	-	-	-	G or Poly	30	None	NA
Lead-210	liquid scintillation (o)	NA	1	0.335 c	3.76 c	-	-	-	G or Poly	30	None	NA
Potassium-40	EPA 901.1M	NA	~3	0.116 c	0.265 c	-	-	-	G or Poly	250	None	NA

Table 2 (continued)

Soil Sample Analytical Methods and Requirements
Off-Site Soil Sampling Plan
Nu-West Industries, Inc.
Conda Phosphate Operations Facility
Soda Springs, Idaho

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a/ mg/kg = milligrams per kilogram; EPA = U.S. Environmental Protection Agency; RSL = regional screening level; IDEQ = Idaho Department of Environmental Quality; REM = Risk Evaluation Manual; IDTL = Idaho default target level; SSL = soil screening Level; Eco-SSL = ecological soil screening level; mg/kg = milligrams per kilogram; pCi/g = picocuries per gram; G = glass; Poly = polyethylene; ^{o}C = degrees Celsius; s.u. = standard units; mV = millivolts; ASAP = as soon as possible; NA = not applicable; "-" not available or not developed; "n" indicates RSL based on non-carcinogenic toxicity; "m" indicates RSL may exceed the ceiling limit; "c" indicates RSL based on carcinogenic toxicity.

b/ SW-846 source:
EPA. 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. As updated and revised.
EPA source:
EPA. 1983. Methods for Chemical Analysis of Water and Waste. EPA 600/4-70-020. As updated and revised.
HASL source:
U.S. Department of Energy. EML Procedures Manual (HASL-300). Environmental Measurements Laboratory. 28th Edition.
ASTM source:
American Society for Testing and Materials.
ASTM D3987-85, Standard Test Method for Shake Extraction of Solid Waste with Water, will be used to prepare samples for analysis of fluoride.
Methods for sample preparation include SW-846 3035B.

c/ EPA RSLs are provided for other than radiological parameters, with the exception of total uranium which is based on non-carcinogenic toxicity. Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm (June 2011). EPA Preliminary Remediation Goals (PRGs) are provided for radionuclides, with the exception of total uranium. Available online at: http://epa-prgs.ornl.gov/radionuclides/ (August 2010).

d/ Idaho REM, July 2004. Available online at http://www.deq.idaho.gov/Applications/Brownfields/index.cfm?site=risk.htm.

e/ EPA Eco-SSLs are available online at http://www.epa.gov/ecotox/ecossl/

f/ Ecological screening benchmark reports available online at: http://www.esd.ornl.gov/programs/ecorisk/benchmark_reports.html. Because No Observed Adverse Effect Level (NOAEL) based benchmarks for soil are not available; the NOAEL-based benchmark for food is reported. Plant uptake factors must be applied to the soil data for comparision to these food benchmarks. Refer to Table 3c for additional discussion on the development of soil screening benchmarks.

g/ The Eco-SSL for aluminum is based on soil pH because the potential toxicity or bioaccumulation of alumnium cannot be reliably predicted based on total aluminum concentrations. Therefore, the ecological SSL for aluminum is identified as a site soil pH less than 5.5 s.u. If the pH is less than 5.5 s.u., aluminum should be retained as a constituent of potential concern.

h/ The RSL for diet is reported for cadmium; the RSL for non-diet is reported for manganese.

i/ To determine potential impacts from the releases, sample concentrations for these parameters will be compared to background concentrations.

j/ The values are for trivalent chromium.

k/ Due to the complex nature of the bioavailabilty of iron to plants and depenedence on site-specific soil conditions, a benchmark for iron was not developed. To evaluate iron, site-specific measurements of pH and Eh should be used to determine the expected valence state of iron and resulting bioiavailability and toxicity. Generally, in well-aerated soils, a pH between 5 and 8 s.u. is not expected to be toxic for iron.

l/ Both the individual radionuclide PRG and radionuclide plus decay chain series PRG are reported.

m/ The non-carcinogenic RSL (shown) is lower than the non-carcinogenic PRG. The values shown are for soluble uranium salts; there are no RSLs or PRGs for insoluble uranium.
The concentrations for U-234, -235, and -238 will be converted from pCi/g to mg/kg using these formulae:

U-234: 1 pCi/g = 1.64×10^{-4} mg/kg
U-235: 1 pCi/g = 4.6×10^{-1} mg/kg
U-234: 1 pCi/g = 2.98 mg/kg

The results will be summed for comparison with the total uranium screening values.

n/ The ecological screening benchmark value for the phytotoxicity of uranium is shown (5 mg/kg). The adjusted wildlife soil value, which will be calculated based on soil sample data and plant uptake factor may be lower. The lower of these values (5 mg/kg phytotoxicity benchmark value or the to-be-calculated adjusted wildlife soil value) will be used for screening.

o/ In-house laboratory method.

Table 3a

Summary of Human Health Screening Levels
Off-Site Soil Sampling Plan
Nu-West Industries, Inc.
Conda Phosphate Operations Facility
Soda Springs, Idaho (a)

		Human Health Screening Levels		
COIs		**EPA Residential Soil Screening Level (b)**	**EPA Industrial Soil Screening Level (b)**	**IDEQ REM IDTL/ Critical Pathway (c)**
Metals (mg/kg)				
Aluminum		7,700 n	9,900 nm	-
Antimony		3.1 n	4.1 n	-
Arsenic		0.39 c	1.6 c	-
Barium		1,500 n	1,900 nm	-
Beryllium		16 n	20 n	-
Cadmium		7 n (e)	80 n (e)	-
Calcium		- (f)	- (f)	-
Chromium (total)		12,000 nm	15,000 nm	-
Iron		5,500 n	7,200 nm	-
Lead		400 n	800 n	-
Magnesium		- (f)	- (f)	-
Manganese		1,800 n (e)	2,300 n (e)	-
Nickel		150 n	200 n	-
Potassium		- (f)	- (f)	-
Selenium		39 n	51 n	-
Sodium		- (f)	- (f)	-
Thallium		0.078 n	0.1 n	-
Vanadium		39 n	52 n	-
General Chemistry (mg/kg)				
Fluoride (total)		310 n	410 n	-
pH (s.u.)		- (f)	- (f)	-
Radiological (pCi/g)				
Gross alpha	α	- (f)	- (f)	-
Gross beta	β	- (f)	- (f)	-
Radium-226	α	0.199 / 0.0121 c (g)	3.28 / 0.023 c (g)	-
Radium-228	β	0.269 / 0.0292 c (g)	7.56 / 0.0484 c (g)	-
Uranium-234	α	4.02 c	29.1 c	-
Uranium-235	α	0.192 / 3.95 c (g)	0.348 / 30.9 c (g)	-
Uranium-238	α	4.48 / 0.696 c (g)	33.0 / 1.49 c (g)	-
Uranium (mg/kg;h)	α	23 n	310 n	-
Thorium-230	α	3.46 c	18 c	-
Polonium-210	α	38.2 c	245 c	-
Lead-210	β	0.335 c	3.76 c	-
Potassium-40	β	0.116 c	0.265 c	-

The EPA screening values provided for non-carcinogenic parameters (n) are 1/10th of the published screening levels to account for cumulative adverse effects.

Table 3a (continued)

Summary of Human Health Screening Levels
Off-Site Soil Sampling Plan
Nu-West Industries, Inc.
Conda Phosphate Operations Facility
Soda Springs, Idaho

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a/ mg/kg = milligrams per kilograms; s.u. = standard units; pCi/g = picocuries per gram; EPA = U.S. Environmental Protection Agency; IDEQ = Idaho Department of Environmental Quality; REM = Risk Evaluation Manual; IDTL = Idaho Default Screening Level;
"n" indicates RSL based on non-carcinogenic toxicity; "m" indicates RSL may exceed the ceiling limit;
"c" indicates RSL based on carcinogenic toxicity; "-" indicates screening level not developed.

b/ EPA Regional Screening Levels (RSLs) are provided for other than radiological parameters, with the exception of total uranium which is based on non-carcinogenic toxicity.
Available online at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm (June 2011).
EPA Preliminary Remediation Goals (PRGs) are provided for radionuclides, with the exception of total uranium.
Available online at: http://epa-prgs.ornl.gov/radionuclides/ (August 2010).

c/ Idaho REM, July 2004. Available online at http://www.deq.idaho.gov/Applications/Brownfields/index.cfm?site=risk.htm.

d/ SW-846 source: EPA. 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.
EPA source: EPA. 1983. Methods for Chemical Analysis of Water and Waste. EPA 600/4-70-020.
ASTM source: American Society for Testing and Materials.

e/ The RSL for diet is reported for cadmium; the RSL for non-diet is reported for manganese.

f/ To determine potential impacts from the releases, sample concentrations for these parameters will be compared to background concentrations. In such instances, i.e., there is no screening level, exceedences of the background levels will not require further action.

g/ Both the individual radionuclide PRG and radionuclide plus decay chain series PRG are reported.

h/ The non-carcinogenic RSL (shown) is lower than the non-carcinogenic PRG.
The values shown are for soluble uranium salts; there are no RSLs or PRGs for insoluble uranium.
The concentrations for U-234, -235, and -238 will be converted from pCi/g to mg/kg using these formulae:

U-234: 1 pCi/g = 1.64×10^{-4} mg/kg
U-235: 1 pCi/g = 4.6×10^{-1} mg/kg
U-234: 1 pCi/g = 2.98 mg/kg

The results will be summed for comparison with the total uranium screening values.

i/ In-house laboratory method.

Table 3b

Summary of Ecological Screening Levels
(EPA Eco-SSLs)
Off-Site Soil Sampling Plan
Nu-West Industries, Inc.
Conda Phosphate Operations Facility
Soda Springs, Idaho (a)

		EPA Eco-SSLs (b)			
			Soil	Wildlife	
COIs		Plants	Invertebrates	Avian	Mammalian
Metals (mg/kg)					
Aluminum		- (c)	- (c)	- (c)	- (c)
Antimony		-	78	-	0.27
Arsenic		18	-	43	46
Barium		-	330	-	2,000
Beryllium		-	40	-	21
Cadmium		32	140	0.77	0.36
Chromium		-	-	26 (d)	34 (d)
Iron		- (e)	- (e)	- (e)	- (e)
Lead		120	1,700	11	56
Magnesium		-	-	-	-
Manganese		220	450	4,300	4,000
Nickel		38	280	210	130
Potassium		-	-	-	-
Selenium		0.52	4.1	1.2	0.63
Sodium		-	-	-	-
Thallium		-	-	-	-
Vanadium		-	-	7.8	280
General Chemistry (mg/kg)					
Fluoride		-	-	-	-
pH (s.u.)		- (c,e)	- (c,e)	- (c,e)	- (c,e)
Radiological (pCi/g)					
Gross alpha	α	-	-	-	-
Gross beta	β	-	-	-	-
Radium-226	α	-	-	-	-
Radium-228	β	-	-	-	-
Uranium-234	α	-	-	-	-
Uranium-235	α	-	-	-	-
Uranium-238	α	-	-	-	-
Thorium-230	α	-	-	-	-
Polonium-210	α	-	-	-	-
Lead-210	β	-	-	-	-
Potassium-40	β	-	-	-	-

a/ mg/kg = milligrams per kilograms; s.u. = standard units; pCi/g = picocuries per gram; EPA = U.S. Environmental Protection Agency; Eco-SSL = ecological soil screening level; "-" indicates screening level not developed.
To determine potential impacts from the releases, sample concentrations for parameters without screening levels will be compared to background concentrations.

b/ EPA Ecological SSLs are available online at http://www.epa.gov/ecotox/ecossl/

c/ The Eco-SSL for aluminum is based on soil pH because the potential toxicity or bioaccumulation of alumnium cannot be reliably predicted based on total aluminum concentrations. Therefore, the ecological SSL for aluminum is identified as a site soil pH less than 5.5 s.u. If the pH is less than 5.5 s.u., aluminum should be retained as a constituent of potential concern.

d/ The values are for trivalent chromium.

e/ Due to the complex nature of the bioavailabilty of iron to plants and depenedence on site-specific soil conditions, a benchmark for iron was not developed. To evaluate iron, site-specific measurements of pH and Eh should be used to determine the expected valence state of iron and resulting bioavailability and toxicity. Generally, in well-aerated soils, a pH between 5 and 8 s.u. is not expected to be toxic for iron.

Table 3c

Summary of Ecological Screening Levels
(Ecological Screening Benchmarks)
Off-Site Soil Sampling Plan
Nu-West Industries, Inc.
Conda Phosphate Operations Facility
Soda Springs, Idaho (a)

	Ecological Screening Benchmark Reports (b)									
	Wildlife (c)									
Parameters	Little Brown Bat	Short-Tailed Shrew	White-Footed Mouse	Meadow Vole	Mink	Cottontail Rabbit	Red Fox	Whitetail Deer	Rough-Winged Swallow	American Robin
Metals (mg/kg)										
Thallium	0.059	0.027	0.097	0.111	0.042	0.028	0.039	0.068	-	-
General Chemistry (mg/kg)										
Fluoride (total)	319.8	149.4	527.1	602.7	229	151.8	215.4	371.5	-	-
Radiological (mg/kg)										
Uranium	12.802 (d)	5.981 (d)	21.009 (d)	24.129 (d)	9.167 (d)	6.075 (d)	8.622 (d)	14.874 (d)	21.2 (e)	13.2 (e)

	Ecological Screening Benchmark Reports								
	Wildlife (c)							Soil Invertebrates and Microbial Processes	
Parameters	American Woodcock	Cooper's Hawk	Barn Owl	Barred Owl	Red-Tailed Hawk	Wild Turkey	Terrestrial Plants	Earthworms	Micro-Organisms and Microbial Processes
Metals (mg/kg)									
Thallium	-	-	-	-	-	-	1	-	-
General Chemistry (mg/kg)									
Fluoride (total)	10.3	45.1	29.1	66.6	80.6	260	200 (f)	-	-
Radiological (mg/kg)									
Uranium	21.1 (e)	92.4 (e)	59.6 (e)	136.6 (e)	165.3 (e)	533.3 (e)	5	-	-

a/ EPA = U.S. Environmental Protection Agency; mg/kg = milligrams per kilogram; "-" indicates screening level not developed.
Screening levels for belted king fisher, river otter, great blue heron, and osprey are not shown as the release areas do not support their habitats.
b/ Ecological screening benchmark reports available online at: http://www.esd.ornl.gov/programs/ecorisk/benchmark_reports.html.
Ecological screening benchmarks reported, where available, only for those constituents for which no EPA Ecological Soil Screening Level is available.
c/ A No Observed Adverse Effect Level (NOAEL) based benchmark for soil is not available; therefore the NOAEL-based benchmark for food is reported.
A plant uptake factor must be applied to soil data for comparison to the food NOAEL-based benchmark.
d/ The wildlife NOAEL-based benchmark for mammals is based on toxicity testing of the uranyl acetate form.
e/ The wildlife NOAEL-based benchmark for avain species is based toxicity testing of the depleted metallic uranium form.
f/ The ecological benchmark for fluorine is reported.